State Route - 48
(New Bingham Highway)
Copperton to Bangerter Highway
Level One Corridor Study

June 2007

UDOT
Planning Section

Executive Summary

Corridor studies are the map for the Utah Department of Transportation (UDOT) and local governments to identify, evaluate, and set priorities for the statewide transportation system. They provide information to develop regional and statewide long-range transportation plans which, in turn, provide projects to short-range transportation improvement programs.

The SR-48 Corridor Study begins at milepost 0.0 on the west side of Copperton, Utah and ends at the intersection of SR-154, also known as the Bangerter Highway, at approximately milepost 8.14. Because of the length of the corridor and the variability of traffic volume and development, it has been divided into three segments based upon historic traffic characteristics and the intensity of commercial and residential development.

The three main concerns with SR-48 are safety, future travel demand, and West Jordan City's Transportation Master Plan.

Accident data analysis has shown that the expected accident rate was exceeded every year from 2002 to 2005 for the three segments of SR-48 studied. Most of the accidents occurred at intersections, and they were right angle collisions between left turning traffic and opposing through traffic. Other types of accidents such as rear-end and T-bone collisions were also observed. There were only two wildlife related accidents from 2002 to 2005. Two fatalities were recorded, both at the intersection of SR-48 and SR-111 in 2005. Other accidents resulted in different types of injuries or possibly no injuries. UDOT Planning may want to consider recommending to UDOT Traffic and Safety that a safety study be performed on SR-48.

UDOT has planned a major capacity improvement for part of Segment 1 from SR-111 (milepost 3.02) to 5600 West (milepost 5.34). Within this boundary, UDOT plans to widen SR-48, currently a two lane facility, to four lanes before 2030. Traffic analysis has shown that future travel demand will exceed capacity in Segment 1. UDOT has also planned to widen the highway-rail grade crossing (milepost 6.6) to four lanes by 2010.

West Jordan City's Transportation Master Plan utilizes a grid pattern (streets running north/south and east/west) which shows the phasing out of SR-48 and the replacement of this route by 9000 South. The plan calls for 9000 South to become the main east/west connector from I-15 to Bangerter Highway, for the proposed Mountain View Corridor, and to SR-111. However, West Jordan City's plan is presently inconsistent with UDOT's plan, which maintains SR-48 as the corridor from I-15 to SR-111 and to Copperton. UDOT Planning may want to consider communication with West Jordan City about further study and possibilities for this corridor.

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Figures & Tables

1 IDENTIFICATION OF TRANSPORTATION CORRIDOR STUDY AREA

The Utah Department of Transportation's (UDOT) objective of corridor studies is to develop a best-practice management strategy of the overall statewide transportation system through data collection and analysis of the individual corridors of which it is comprised. Corridor studies investigate conditions of a route and develop possible transportation solutions. They provide an opportunity for UDOT and local government(s) to discuss the corridor and how the corridor does or does not serve their interests or plans. This process may identify strategies where the corridor can best serve both state and local government interests. Corridor plans are developed from the studies and identify which possible improvements may be needed to improve Utah's transportation system into the future. Corridor plans are the map for UDOT to identify, evaluate, and set priorities for the corridor transportation system. They provide information to develop regional and statewide long-range transportation plans for the 20 plus year horizon which, in turn, provides projects to short-range transportation improvement programs for a six year planning horizon.

Corridor planning is UDOT's program for managing its transportation systems, i.e. the state-administered portion of the overall network, for the long-range plan horizon, and for establishing a vision of corridor needs beyond that. Each corridor study area includes the transportation corridor – the geographic area that influences its performance – in addition to the transportation systems and facilities that make up the corridor.

UDOT has developed and is continuing to refine a statewide highway project prioritization system. A number of factors and issues contribute to a project's priority including those related to safety criteria, capacity, pavement management, and bridge sufficiency. This system is used to determine which projects should receive priority status, and to assist in establishing a system-wide needs list and long-range plan. Individual corridor plans are one of UDOT's main methods to define corridor and system needs. The proposed projects identified by corridor studies may be primarily focused on preservation, safety, system management, or mobility.

1.1 Corridor Description

The SR-48 Corridor Study begins at milepost 0.0 on the western border of Copperton, Utah and extends eastward to its intersection with SR-154, also known as the Bangerter Highway, at approximately milepost 8.14. Due to the length of the corridor and the variability of traffic volume and development, the corridor has been divided into three segments. The segments are based upon historic traffic characteristics and the intensity of commercial and residential development.

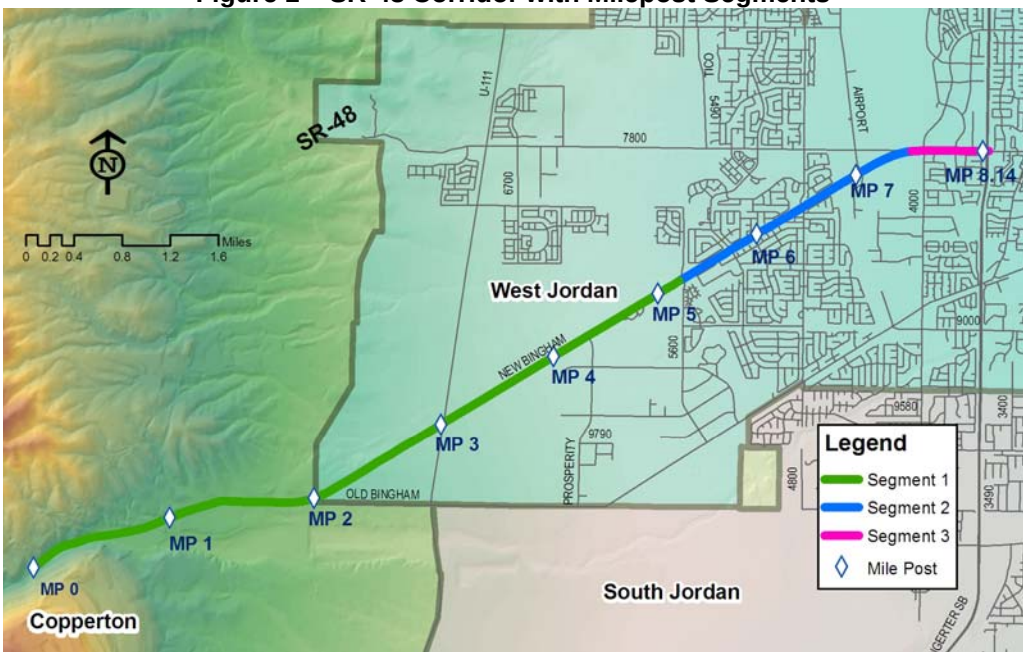
- Segment 1 begins at milepost 0.0 and ends at milepost 5.34 at the intersection of 5600 West. There has been limited commercial and residential development in this segment, as reflected by historically low traffic volumes.

- Segment 2 begins at milepost 5.34 and ends at milepost 7.52 at the intersection of 7800 South. Segment 2 runs diagonally through the grid transportation system of West Jordan City. The amount of development in this segment has historically been higher than in Segment 1 but lower than in Segment 3. Commercial and residential development on property adjacent to this segment has increased rapidly. Traffic volumes are expected to increase also.

- Segment 3 begins at milepost 7.52 and ends at milepost 8.14 at the intersection of SR-154. This segment has historically had a higher rate of commercial and residential development on property adjacent to SR-48, which reflects the highest traffic volumes of the three segments.

Figure 1 shows a map of the SR-48 corridor with the three defined milepost segments.

Figure 1 – SR-48 Corridor with Milepost Segments



SR-48 is primarily a two lane facility with shoulders in Segment 1. Segments 2 and 3 have four lanes, shoulders, and a center turn lane along most of roadway. There are six signals in the 9.42 miles of roadway, and the posted speed limit is 55 mph in Segment 1 and 45 mph in Segments 2 and 3. Land parcel maps show a right-of-way that ranges from 100 feet in Segment 1 to 135 feet in Segment 3. Table 7 lists the specific rights-of-way for each segment.

1.2 Environmental, Cultural, and Historical Locations within the Corridor

There are some environmental groundwater contamination issues in southwestern Salt Lake Valley, but none that directly affect the SR-48 corridor.

Cultural and important locations along the corridor include the dry farms, Copper Hills High School, Salt Lake City Airport #2, and the Jordan Landing shopping center. This corridor provides access to Airport #2, which is owned by Salt Lake City Corporation and operated by the Salt Lake City Department of Airports. It is the principal general aviation reliever airport for Salt Lake City International Airport. The airport is located in West Jordan City and encompasses an area of 920 acres.

The only identified historic site adjacent to the SR-48 corridor is the city of Copperton. In the 1920s, Kennecott Utah Copper began to build a unique company town – Copperton – east of their open-pit mine in Bingham Canyon. Constructed for company supervisors and skilled workers, the town was to be a showplace for the use of copper and copper-related products. Because of its architecture, Copperton is now a historic district listed in the National Register of Historic Places. SR-48 still serves as the main access to Copperton and the Bingham Canyon Mine. Although the exact year is unknown, Figure 2 shows an early photo of Copperton, probably circa 1925.

Figure 2 – Copperton, Utah

Source: www.historytogo.utah.gov *website, 2007*

1.3 Historical Perspective of the Corridor

State Route 48 was primarily constructed to provide truck and employment access to the Bingham Canyon Mine. The road was constructed at a diagonal to provide the most direct route to the mine. At the time, West Jordan City was much smaller, and development did not extend past 3200 West. With technological advancements, Kennecott Utah Copper has recently

experienced reduced employment, thus decreasing the need for SR-48 to carry workers. Today, this corridor primarily serves industrial development at the West Jordan Industrial Park, commercial development at Jordan Landing, and residential developments along Segments 2 and 3 of the corridor as shown in Figure 3.

1.4 Population, Employment, and Demographics

SR-48 is primarily located within the city limits of West Jordan City. According to the US Census Bureau, population in West Jordan City has increased every ten years. It is expected to continue to grow in future years as shown in Table 1. It is expected that traffic on SR-48 will increase with population growth. SR-48 also serves Copperton. Copperton is not incorporated and has a small base population and low growth rate according to the US Census Bureau as shown in Table 1. Much of the land in Copperton is owned by Kennecott Utah Copper and is used for industrial purposes which limit Copperton's growth potential.

Table 1 – Population

Year	West Jordan City	10 year increase	Copperton (Unincorporated)	10 year increase
1980	27,327		580	
1990	42,892	57%	660	14%
2000	68,336	59%	726	10%
2005	91,444	(not 10 years)	Population estimates not available	
2010	126,021	38%	Population estimates not available	
2020	144,941	15%	Population estimates not available	
2030	152,393	5%	Population estimates not available	

Source: US Census Bureau, 2000 and WFRC Technical Memo #42, 2003

Employment along SR-48 is found in each of the three segments. However, the employment and needs of industries vary. Employers like Kennecott Utah Copper, Sysco Intermountain Food Services, and Dannon Yogurt Company are found in Segment 1 of SR-48. Also, Kraft Maid will be locating in West Jordan City along Segment 1 of SR-48, and it will employ approximately 1,300 people. Most of the needs along Segment 1 are freight and commuter traffic. This may change in the future if the dry farms are converted to residential subdivisions. In Segment 2, there is the Jordan Landing Industrial Park which has 210 total acres and 75 vacant acres. The industrial park also contains freight and commuter traffic needs. Finally, Segment 3 contains major employment areas such as the Jordan Landing shopping center which contains some of West Jordan's largest retail employers including Wal-Mart, Sam's Club, and Sears Grand. The needs in this segment

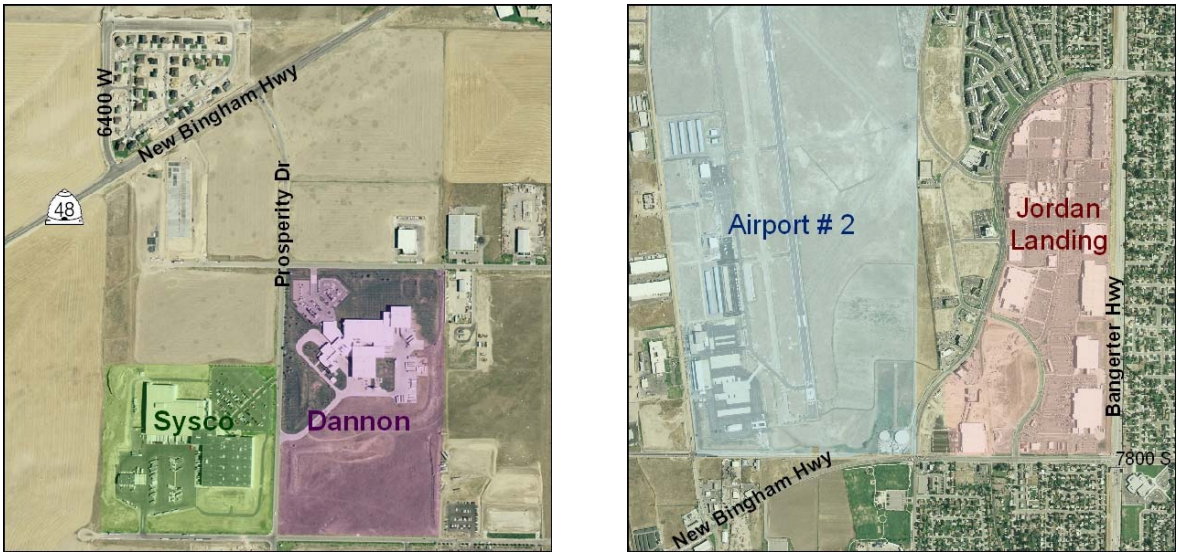
include freight, commuter, and retail shopping traffic. Table 2 shows past employment numbers and future employment projections. Figure 3 shows major employment locations along SR-48. Since land use and transportation are linked together, the employers and shopping in the area have had an impact on the increase in traffic volumes along Segment 3 of the corridor.

Table 2 – Employment

Year	West Jordan City Employment Estimates	5 year increase	WFRC Employment Estimates	5 year increase
1990	10,400		Estimates not available	
1995	10,899	5%	Estimates not available	
2000	25,892	138%	Estimates not available	
2005	29,134	13%	26,062	
2010	33,775	16%	33,175	27%
2015	37,290	10%	43,203	30%
2020	41,171	10%	47,883	11%

Source: West Jordan City Website, 2007 and WFRC Technical Memo #42, 2003

Figure 3 – Major Employment Locations



2 ANALYSIS OF EXISTING CONDITIONS

The existing conditions analysis summarizes the existing land use patterns, traffic patterns/characteristics, environment, utilities, right-of-way, safety, geometric design, structures, maintenance, pavement condition, alternative modes and efficient intermodal transfer, access management strategies, and other relevant studies.

2.1 Analysis Area

2.1.A Land Use Patterns

Current land use along the corridor is agricultural, residential, commercial, or industrial, as presented in the Table 3. Future land use along this corridor in West Jordan City varies from residential to industrial. In Copperton, land use is mostly residential with low intensity commercial and some industrial.

Table 3 – Land Use

Segment	Residential	Commercial	Industrial	Vacant (estimate)
1	Low	Low	Low	60 %
2	Medium	Medium	Medium	40 %
3	Medium	High	High	15%

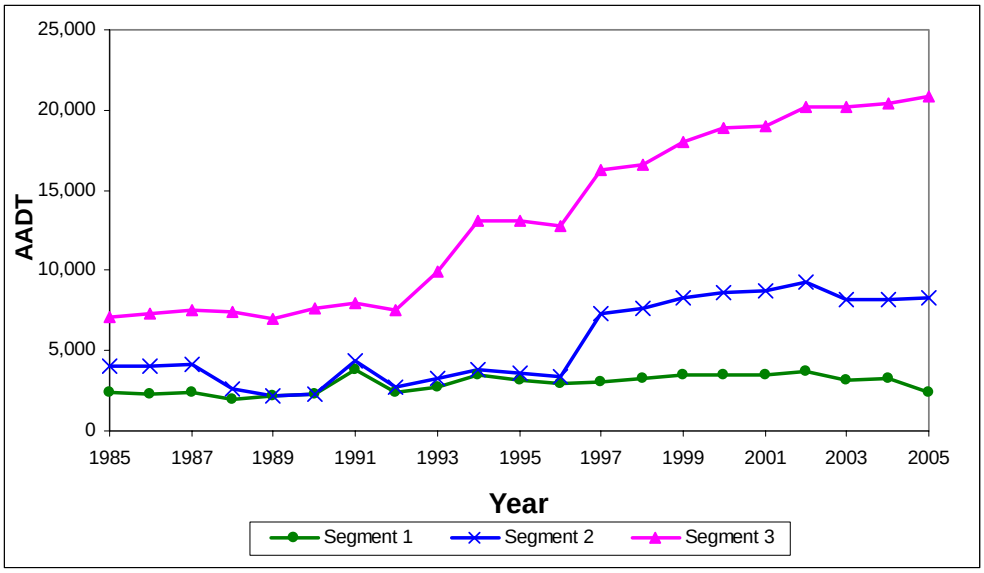
2.1.B Traffic Patterns/Characteristics

The major traffic generators along this corridor are Jordan Landing shopping center, Kennecott Utah Copper, Dannon Yogurt, Sysco, Copper Hills High School, and various residential developments.

Traffic patterns varied widely in each segment from 1985 to 2005 along SR-48 as shown in Figure 4. To compute historic growth rates, it was assumed that traffic growth on this corridor was linear from 1985 to 2005. Traffic growth in Segment 1 was the lowest; its growth was minimal and almost remained constant. In the 20 years from 1985 to 2005, this segment experienced a yearly growth of two percent, an average of 54 additional vehicles per year. Historic traffic trends show that traffic in Segment 2 was higher than in Segment 1 but lower than in Segment 3. Segment 2 experienced a sudden increase (119 percent) in traffic volume from 1996 to 1997 because the Dannon Yogurt plant was under construction in 1996 and opened in 1997, but traffic in Segment 2 generally grew at a rate of 18 percent per year (348 vehicles per year based on 1985 volume) from 1985 to 2005. Segment 3 experienced the highest traffic volumes in the past compared to the other two segments along the corridor. Traffic growth in Segment 3 from 1985 to 2005 was

the same as in Segment 2, 18 percent, but this translated to 848 vehicles per year based on 1985 volumes.

Figure 4 – Historic Traffic Trends



Source: Traffic on Utah Highways

2.1.C Environment

The following contains screening level information regarding various environmental topics.

Economic

The two main industrial businesses along the corridor (Kennecott Utah Copper and Sysco Intermountain Food Services) generate high truck volumes on SR-48. As per UDOT's Truck Traffic on Utah Highways 2005 report, 19 percent of AADT in 2005 was trucks across the whole length of the corridor. Another economic issue of concern is the Jordan Landing shopping center which contains big box retail, restaurants, and associated retail. These developments generate traffic that use SR-48, leading to an increase in demand. As mentioned earlier, Kraft Maid will be locating along the corridor, and it will also be a major traffic generator.

Air Quality

Salt Lake County is a Non-attainment Area for Particulate (PM10). SR-48 is located with Salt Lake County.

Noise

In Segments 2 and 3, noise was generally perceived to be higher because of the traffic mix volume from regular traffic, heavy trucks, and aircraft operations at Airport Number 2. However, aircraft is limited to small engine, general aviation aircraft at this airport. Noise walls have been implemented, and signs prohibiting engine brakes are posted along these segments of the

corridor. In Segment 1, noise is lower because the mix of traffic volume is low. It is expected that noise will increase in the future as land use changes and truck volume increases.

Water Quality

Groundwater contamination in the southwestern Salt Lake Valley consists of several areas of contamination, or plumes. According to the Kennecott Utah Copper Corporation's Managing Environmental Cleanup Update 2003 publication, the major area of contamination lies east of the mouth of Bingham Canyon where the water is acidic and contains elevated levels of heavy metals and sulfate. Other groundwater areas are affected only by sulfates from mining and non-mining sources.

Wetlands

According to the National Wetlands Inventory (NWI) maps, the wetlands that have been identified along the corridor are on Kennecott Utah Copper property in Copperton. They are listed as diked and impounded wetlands. These diked water ponds are used for industrial purposes by Kennecott.

Wildlife

The Copperton General Plan has identified habitats close to the corridor for four animal species. The first is the mule deer. It has high value summer and winter use on the west end of Segment 1. The cougar is also listed to have high value summer and winter use on the west end of Segment 1. Elk have high value summer and critical value winter habitat for the same location. The Ruffed-Legged Hawk has critical value use of habitat located one mile north of the corridor and west of SR-111. According to the Copperton General Plan map, this hawk habitat is not inside the corridor.

Threatened or Endangered Species

The following two tables contain Salt Lake County animal and plant species that are or have been listed as one or more of the following: Federally-listed or candidate species under the Endangered Species Act (S-ESA), Wildlife species of concern (SPC), and Species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing (CS). The animals and plants listed below are found in Salt Lake County but may not be specific to the corridor of SR-48.

Table 4 – Species in Salt Lake County of S-ESA, SPC, or CS Status		
Common Name	Scientific Name	State Status
American White Pelican	Pelecanus Erythorhynchos	SPC
Bald Eagle	Haliaeetus Leeucocephalus	S-ESA
Black Swift	Cypseloides Niger	SPC
Bobolink	Dolichonyx Oryzivorus	SPC
Bonneville Cutthroat Trout	Oncorhynchus Clarkii Utah	CS
Burrowing Owl	Athene Cunicularia	SPC
California Floater	Anodonta Californiensis	SPC
Columbia Spotted Frog	Rana Luteiventris	CS
Ferruginous Hawk	Buteo Regalis	SPC
Grasshopper Sparrow	Ammodramus Savannarum	SPC
Greater Sage-Grouse	Centrocercus Urophasianus	SPC
June Sucker	Chasmistes Liorus	S-ESA
Kit Fox	Vulpes Macrotis	SPC
Least Chub	Iotichthys Phlegethontis	CS
Lewis' Woodpecker	Melanerpes Lewis	SPC
Long-Billed Curlew	Numenius Americanus	SPC
Lyrate Mountainsnail	Oreohelix Haydeni	SPC
Northern Goshawk	Accipiter Gentilis	CS
Short-Eared Owl	Asio Flammeus	SPC
Smooth Greensnake	Opheodrys Vernalis	SPC
Spotted Bat	Euderma Maculatum	SPC
Three-Toed Woodpecker	Picoides Tridactylus	SPC
Townsend's Big-Eared Bat	Corynorhinus Townsendii	SPC
Western Pearlshell	Margaritifera Falcata	SPC
Western Toad	Bufo Boreas	SPC
Yellow-Billed Cuckoo	Coccyzus Americanus	S-ESA

S-ESA (Federally-listed or candidate species under the Endangered Species Act)
SPC (Wildlife species of concern)
CS (Species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing)

Source: State of Utah, Natural Resource, Division of Wildlife Resources, Sensitive Species by County, 2006.

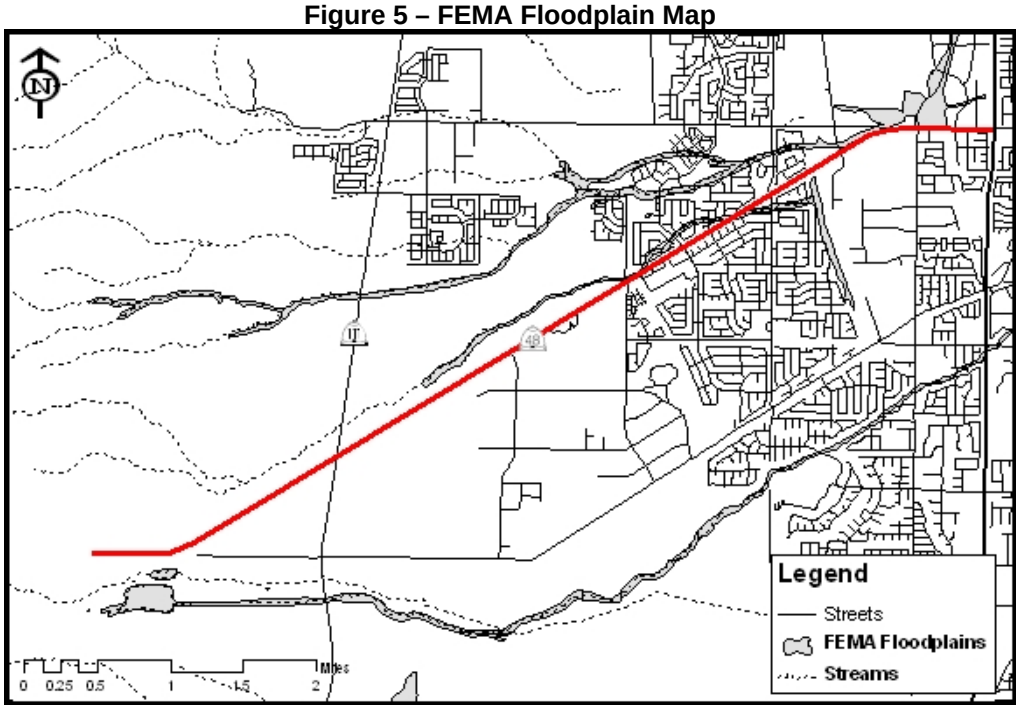
Table 5 – Plants in Salt Lake County of S-ESA, SPC, or CS Status		
Common Name	Scientific Name	State Status
Utah Angelica	Angelica Wheeleri	Rare
Ute ladies'-Tresses,	Spiranthes Diluvialis	Rare

Source: State of Utah, Natural Resource, Division of Wildlife Resources, Plants.

Flood Plain

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) shows four areas along the corridor that are listed as Flood Zone A. Three areas are located in Segment 2 (milepost 5.34 to milepost 7.52) and one in the Segment 3 (milepost 7.52 to milepost 8.14), as shown in Figure 5. Not all floodplains are wetlands, but if improvements were made in Segment 3, there would be a need for wetland delineation.

Figure 5 – FEMA Floodplain Map



Wild and Scenic Rivers

According to the National Wild and Scenic Rivers System website, there are no wild and scenic rivers within the vicinity of the corridor.

Historic and Archeological Preservation

A historic marker sign was placed at milepost 0.05 in Copperton. Now absent from that location, the historic marker is supposedly in the possession of Kennecott Utah Copper. The historic marker is meant to commemorate the importance of the old mining town of Bingham which was literally buried by mine tailings as the Bingham Canyon Mine expanded over the years. The old town of Bingham is located up Bingham Canyon, well beyond the beginning of SR-48.

Fossil Preservation

No known fossil preservation is being conducted along the corridor.

Hazardous Waste Sites

Kennecott has received a Record of Decision by the U. S. Environmental Protection Agency, Region VIII for a 20-acre area known as the Precipitation Plant, which is located west of Copperton on Bingham Creek, outside the SR-48 study area. There is an old gas station at milepost 1.20 that presumably has buried gas tanks.

Visual Impacts

There are no long-term visual impacts along SR-48 where improvements may be implemented. However, vegetation disturbed during construction may require restoration.

Prime and Unique Farmlands
No Agricultural Protection Areas have been identified along the corridor.

Section 4(f)
The U.S. Department of Transportation's Section 4(f) law (49 USC 303) states that federal funds may not be approved for projects that use land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or any significant historic site. Exceptions may be permitted if it is determined that there is no feasible and prudent alternative to the use of land from such properties and the action includes all possible planning to minimize harm to the property resulting from such use. The following list includes possible Section 4(f) designations:

Table 6 – Possible Section 4(f) Designations

Location	Milepost
Copper Hills High School	5.64
Columbia Elementary School	8.14
Ron Wood Wash Baseball Park	4.74
Sunset Cove Park	6.44

The Copperton Historic District consists of 780 acres and is bounded by SR-48, 5th East, Hillcrest, and 2nd West streets. There are 237 buildings and two structures that have architectural styles including Tudor Revival and Bungalow/Craftsman. There is also the Utah Copper Company Mine superintendent's house located at 104 East State Highway that is on the National Register of Historic Places.

2.1.D Utilities

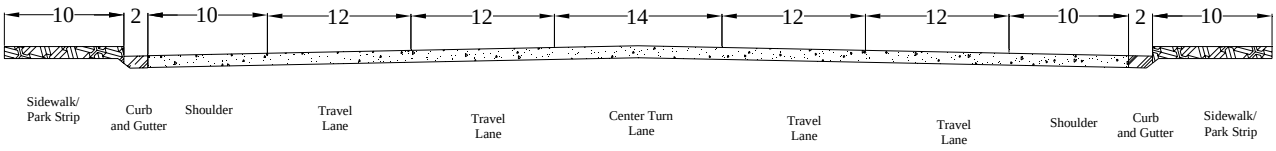
The three segments of the corridor contain standard utilities common to an urban environment such as communication, natural gas, power, sewer, and water lines.

2.1.E Right-of-Way

The right-of-way data for the three segments along the corridor was obtained from land parcel maps and is provided in Table 7 which also lists the existing number of travel lanes. Figure 6 shows a standard cross-section for an arterial as adopted by UDOT. There is enough right-of-way to expand the roadway to a standard arterial configuration within Segments 2 and 3. Overhead utility lines that run parallel to the corridor are probably the only constraint that might limit capacity improvements. However, there is enough right-of-way within these two segments to have the overhead utility lines relocated.

Table 7 – Right-of-Way Width		
Segment	Right-of-Way (feet)	# of Lanes
Segment 1 (mp 0.0 – mp 5.0)	100	2
Segment 1 (mp 5.0 – mp 5.34)	100	4
Segment 2	120	4
Segment 3	135	4

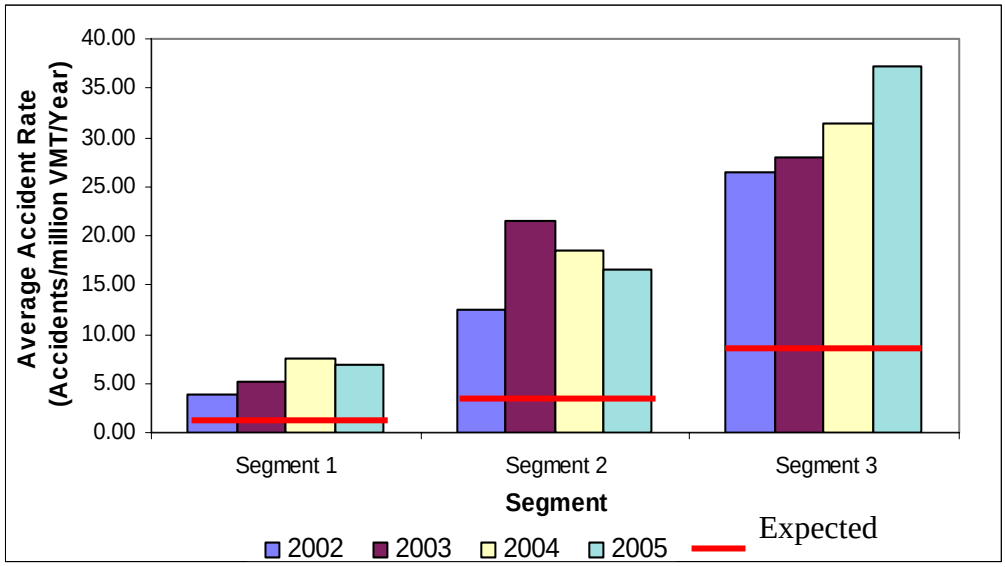
Figure 6 – State Standard Arterial Cross-Section (106 foot right-of-way)



2.1.F Safety

Figure 7 shows the average and expected accidents rates over a four year period. Expected accident values for each segment are also shown as provided by UDOT for the years 2002 to 2005. Both average and expected accident rates are reported in number of accidents per million Vehicle Miles Traveled (VMT) per year. Expected accident rates depend on the functional class of the highway, AADT, and population for an urban road in Segment 2 and 3 and for a rural road in Segment 1. The average accident rate exceeded the expected accident rate which is likely due to the fact that SR-48 has a diagonal alignment and many of the intersections are skewed beyond 90 degrees.

Figure 7 – Average and Expected Accident Rates



The accident rate for Segment 1 increased every year from 2002 to 2004. In 2005, the rate went down slightly. Historic traffic trends have shown a slight decrease in traffic volumes in Segment 1 in 2005. For Segment 2 there was an increase in accident rate in 2003, but since then the accident rate has been decreasing each year. Traffic volume in Segment 2 did not change from 2003 to 2005. Segment 3 has experienced an increase in the accident rate every year from 2002 to 2005. Traffic growth in Segment 3 was the highest compared to the other two segments during that time.

For the three segments, the expected accident rate was exceeded every year from 2002 to 2005. This is an indication that UDOT Traffic and Safety Department may want to study SR-48 for possible mitigation strategies. The values for the expected accident rates plotted in Figure 8 are listed in Table 8.

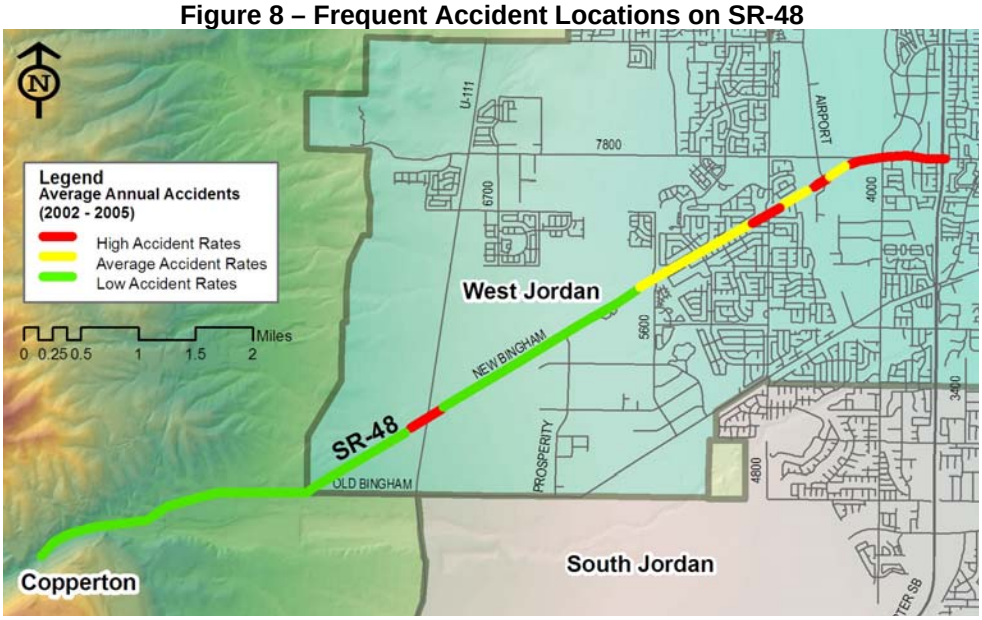
Table 8 – Expected Accident Rates

Milepost	AADT (Weighted Average)				Functional Class	Expected Accident Rate (Accidents per million VMT per year)
	2002	2003	2004	2005		
Segment 1	3,860	3,860	3,130	2,533	Rural-Minor Arterial	1.96
Segment 2	10,608	9,648	9,706	9,725	Urban-Minor Arterial	3.49
Segment 3	20,249	20,249	20,372	20,842	Urban-Minor Arterial	8.84

Source: UDOT Traffic & Safety Division

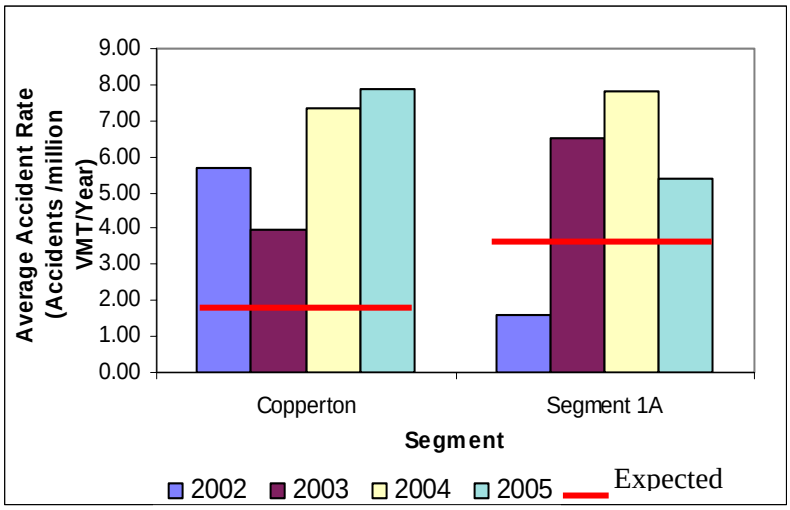
Analysis of accident data has shown that 95 percent of the total accidents occurred at the intersections, especially in Segments 2 and 3, as shown in Figure 8. Approximately 90 percent of the accidents at intersections were right angle collisions between left turning traffic and opposing through traffic. The remaining ten percent included rear end and T-bone collisions. Also, two accidents in Segment 1 were reported to have been caused by wildlife, one in 2004 and the other in 2005. For the four years analyzed (2002 to 2005), two fatalities were recorded at the intersection of SR-48 and SR-111 in 2005. Other accidents resulted in different types of injuries; some reported no injuries.

Figure 8 – Frequent Accident Locations on SR-48



It is important to note that SR-48 is classified by UDOT as a rural-minor arterial from milepost 0.0 to milepost 3.02 (SR-111 intersection) and as an urban-minor arterial from milepost 3.02 to 8.14. Segment 1 as defined in this study, therefore, contains both rural and urban minor arterial roadways. In this report, the whole of Segment 1 has been classified as a rural-minor arterial to analyze safety data as discussed above. However, for detailed accident rate purposes, Segment 1 has been further divided into two subsections which are referred to as "Copperton" (from milepost 0.0 to 3.02) and "Segment 1A" (from milepost 3.02 to milepost 5.34). Figure 9 shows the average and expected accident rates for these minor segments. The expected accident rate for Copperton is 1.96 and for Segment 1A is 3.49. The accident rates in Copperton were higher than the expected values from 2002 to 2005.

Figure 9 – Average and Expected Accident Rates in Copperton and Segment 1A



In both sections of Segment 1, the actual accident rate surpassed the expected accident rate from 2003 to 2005.

2.1.G Geometric Design

Roadway

The roadway geometrics (travel lanes, lane widths, center turn lanes, intersection additional turn lanes, paved shoulders, curb and gutter, and sidewalk) along the corridor are inventoried in Table 9. Each of these features affects capacity and safety of the corridor in various ways. For example, turn lanes are necessary to reduce the conflict between the slow speed turning traffic and the high speed through traffic.

Table 9 – Roadway Geometrics

Feature	Segment 1	Segment 2	Segment 3
Number of Travel Lanes	2	4	4
Lane Widths (feet)	10 (mp 0.0 – 2.0) 12 (mp 2.0 – 5.34)	12	12
Passing Lanes	N/A (mp 0.0 – 3.02) No (mp 3.02 – 5.34)	N/A	N/A
Center Turn Lanes	0%	70%	100%
Intersection Additional Turn Lanes	No (mp 0.0 – 2.9)* Yes (mp 2.9 – 5.34)	Yes	Yes
Paved Shoulders	Yes (mp 0.0 – 2.0) No (mp 2.0 – 5.0)	Yes	Yes
Curb, Gutter	15%	100%	100%
Sidewalk	20%	0%	0%

**Only two right turn lanes exist west of SR-111, at the Kennecott office driveway and the Bingham Canyon Mine driveway.*

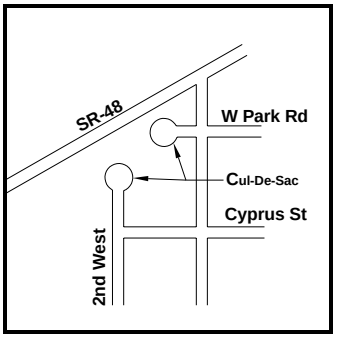
Intersections

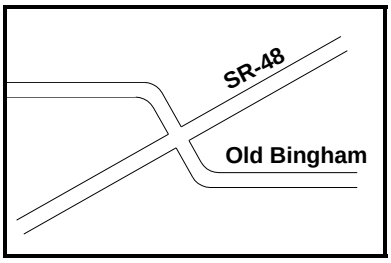
SR-48 is not perpendicularly aligned with the following side roads: SR-111, West Park Street/2nd West Street, and Old Bingham Highway. The AASHTO Green Book states that for safety and economy, intersecting roads should generally meet at right angles.

The misaligned intersections in Figure 10 could be corrected as shown in Figure 11.

Figure 10 – Misaligned Intersections

Figure 11 – Intersection Designs to Correct Misaligned Intersections





2.1.H Structures

A Kennecott grade separated conveyor belt passes over SR-48 in Copperton. A grade separated railroad bridge exists on Segment 1 and passes over SR-48. The railroad right-of-way is owned by Kennecott Utah Copper. No UDOT structures are know to exist on the corridor. However, a UDOT structures inventory was not provided.

2.1.I Maintenance

Visual observations showed that there are no severe pavement structural deficiencies along SR-48. However, some sections have experienced raveling, longitudinal cracking, and transverse cracking as shown in Figure 12 below. Patching has also been done at various locations. These defects are not serious, and they have minimal effects on the structural and functional performance of the pavement. The cracks could be sealed to stop the ingress of water into the underlying pavement layers which has the potential to cause further damage. Moreover, a functional overlay would treat the raveled areas as well as the cracked areas. UDOT Maintenance staff has indicated that there are no scheduled maintenance activities for this corridor, but the system preservation plan does have minor rehabilitation projects to be executed in the next four years.

Figure 12 – Longitudinal Cracking at Milepost 0.1

2.1.J Pavement Condition

A 10-year system preservation plan from 2010 to 2020 is shown in Table 10 which lists scheduled asphalt and safety improvements for this corridor. Although the corridor study of SR-48 ends at milepost 8.14, the UDOT System Preservation Plan extends past this endpoint. As a result, the data in Table 10 extends from milepost 0.0 to milepost 8.61 of SR-48.

Table 10 – System Preservation Plan (2011 – 2020)				
Milepost	Element ID	Year	Treatment	Cost
0.00 – 1.40	048P-00000	2010	Minor Rehabilitation Asphalt	$455,606
0.00 – 1.40	048P-00000	2020	Minor Rehabilitation Asphalt	$612,296
1.40 – 3.02	048P-00140	2011	Minor Rehabilitation Asphalt	$556,465
3.02 – 4.73	048P-00302	2011	Minor Rehabilitation Asphalt	$606,302
4.70 – 8.61	048P-00473	2016	Chip Seal	$639,302
4.73 – 8.61	0048P-007.00	2016	Safety Improvement	$1,343,916

Source: UDOT System Preservation Plan 2011-2020

Drainage

Some parts of SR-48 in Copperton were found to have poor drainage as shown in the photos in Figure 13. There are some shallow collections of water along the shoulders of the pavement at milepost 0.5 and milepost 1.13. The water can easily penetrate into the pavement, causing degradation.

Figure 13 – Poor Drainage Near Milepost 0.5 and Copperton Circle

Striping and Signing

At approximately 6400 West and 5600 West, some of the old lane striping is still visible, which may create confusion for drivers. At other areas, lane striping has faded away and should be refreshed during the next painting season.

Figure 14 – Visible Old Lane Striping at 6400 West and 5600 West

When traveling east at approximately 6400 West, the road widens to two lanes from a single lane road. In less than 200 feet past the point of widening, the second lane becomes a right turn only lane, and through traffic must merge left. The 'Thru Traffic Merge Left' sign has been placed at a distance of less than 300 feet from the point where the lane ends. This may create confusion, and there are chances that some through traffic may continue driving in the right turn only lane because the posted speed limit is 50 mph. According to the Manual on Uniform Traffic Control Devices (MUTCD), this distance should be 625 feet. The same problem occurs just before the Welby Park Drive intersection when traveling west.

Figure 15 – Advance Warning Sign at 6400 West

2.1.K Alternative Modes and Efficient Intermodal Transfer

Evaluating alternative modes of transportation is important to a functional and efficient transportation system. By reviewing modes beyond the traditional highway user as potential solutions, UDOT can move forward in providing a best-practice transportation system.

- Pedestrian – There are sidewalks and trails at most residential, school, park and commercial areas. However, there are short segments without sidewalks within these residential and commercial areas.

- Bicycle – No bike route or lanes currently exist. There are paved shoulders from milepost 0.0 to milepost 2.0 and from milepost 5.0 to milepost 8.14, which provide pavement for bike use. Shoulders could be paved from milepost 2.0 to milepost 5.0 to meet current UDOT standards and provide pavement for bike use. The West Side Trails Study prepared for UDOT Region Two identifies SR-48 as a frequently used route and proposes an on-street bike lane as a priority one project category. The Wasatch Front Regional Council (WFRC) bike map shows a proposed Class II (bike lane) on this corridor. And finally, the Salt Lake County Bicycle Advisory Committee (SLCBAC) draft map also identifies this corridor as a bikeway.

- Mass Transit – The Utah Transit Authority (UTA) operates Bus Route 88 along the corridor approximately every 35 minutes during a.m. and p.m. peak hours. The bus route intersects with nine other bus routes and light rail at the Midvale Center TRAX Station.

Planning and coordination should also continue to take place in other systems of transportation including air and truck transportation, pipelines, and railroads. UDOT plays an important coordination role with each of these, particularly in ensuring efficient intermodal transfer with the highway system.

- Aviation – Airport No. 2, which is located about 800 feet from SR-48, serves small, private airplanes and occasionally smaller, commercial carrier jets when Salt Lake International Airport is closed.

- Truck – The New Bingham industrial park in West Jordan generates the highest truck count, followed by Kennecott Utah Copper in Copperton. It is projected that truck traffic on this corridor will increase with time due to the industrial park and an increase in commercial development.

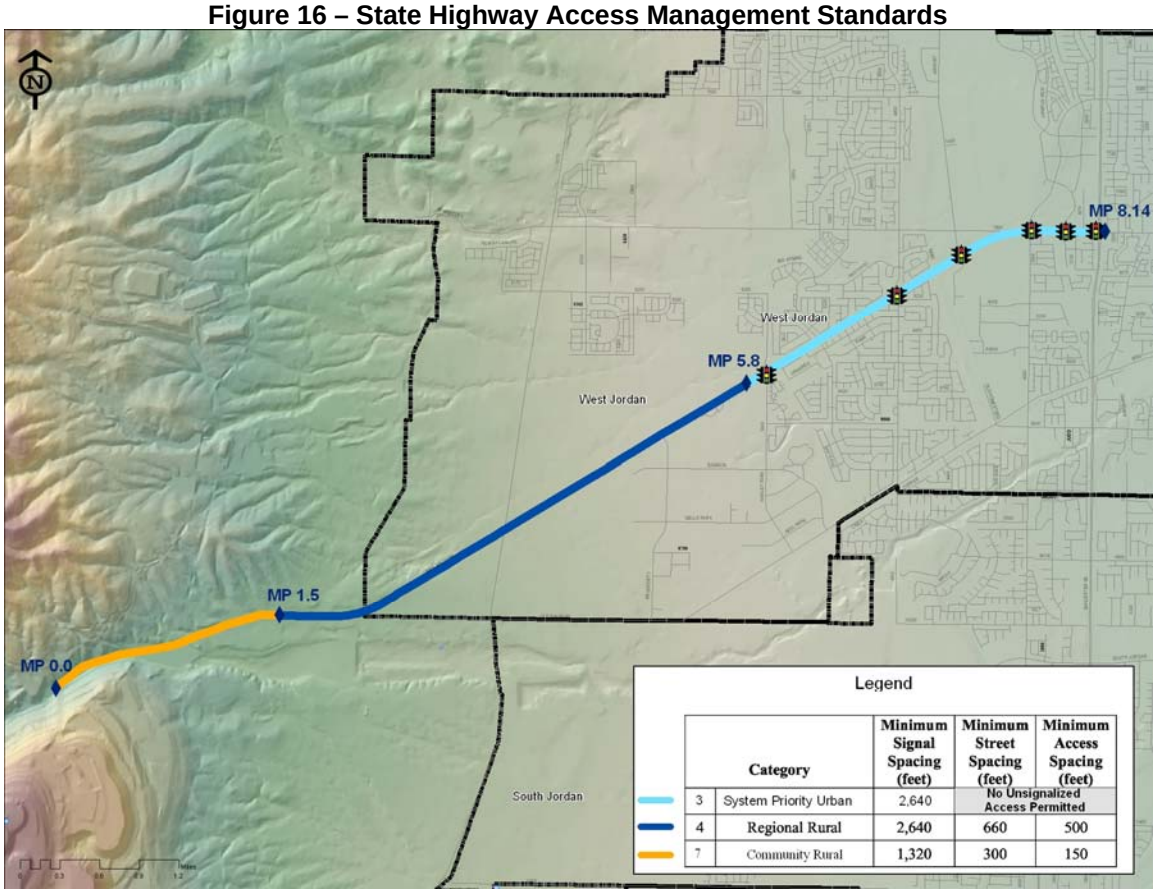
- Pipeline – In Copperton in front of the Kennecott office building, a natural gas line parallels SR-48 for about a mile. Then, it parallels the Old Bingham Highway. Another natural gas line runs parallel to the railroad right-of-way and intersects SR-48 at milepost 6.83.

    1. Railroad – There are two railroads that cross SR-48: the Kennecott Railroad at milepost 1.4 and the Union Pacific Railroad at milepost 6.83. Train traffic can affect traffic flow, especially since the crossing at milepost 6.83 is narrow and only accommodates one lane of travel in each direction off vehicle flow.

2.1.L Access Management Strategies

UDOT adopted Administrative Rule R930-6 to accommodate utilities and to control and protect state highway rights-of-way. The state highway access standards contain nine different categories. SR-48 has three access management categories in the study area. They are shown in Figure 17. However, the current accesses along the corridor do not meet the access management standards as defined below for the three categories. Access management deficiencies are detailed in Section 5 (Corridor Wide Recommendations) of this document.

Figure 16 – State Highway Access Management Standards



Source: UDOT Administrative Rule R930-6, May, 2006

Currently, Segment 2, which has a length of 2.18 miles, has 3 traffic signals. Segment 3 (approximately 0.64 miles) also has 3 signals. The locations of these signals are listed in Table 11. In both segments, the average number of signals per mile violates access standards for signal spacing.

2.1.M Relevant Studies

West Jordan City Transportation Master Plan

West Jordan City has a transportation master plan that utilizes the grid pattern and shows the phasing out of SR-48 and the replacement of this route by 9000 South. However, this local

government plan is presently inconsistent with UDOT's plan. Communication regarding a jurisdictional transfer of SR-48 from UDOT to West Jordan City could be arranged as long as the transportation needs of the corridor are met or another corridor is provided in its place.

Mountain View Corridor Environmental Impact Statement

Further discussion will be needed while the proposed Mountain View Corridor Environmental Impact Statement is under study, but a preferred alternative for the Mountain View Corridor in Salt Lake County is the 5800 West Freeway Alternative. This proposed corridor intersects with SR-48.

Traffic Signals and Traffic Control Devices

During a recent site visit, control delays on a weekday p.m. peak period ranging from 30 seconds to 60 seconds were observed at the following signalized intersections located within Segment 3 of the corridor: Bangerter Highway, 3800 West (Campus View Drive), and 4000 West. Control delays of 30 seconds correspond to a Highway Capacity Manual level of service C. 60 second delays correspond to level of service E. There were no issues observed at the other signalized intersections located within Segment 2.

Table 11 – Signalized Intersections

Segment 1		Segment 2		Segment 3	
Intersection	Milepost	Intersection	Milepost	Intersection	Milepost
SR-111	3.02	Grizzly Way	6.0	4000 W	7.8
		4800 W	6.7	3800 W	8.1
		Welby Park Drive (Airport Rd)	7.3	Bangerter Highway	8.14

The major unsignalized intersections along the corridor include 5600 West, 6400 West and SR-111. A signal warrant analysis is being conducted at the intersections of SR-48 and 6400 West and SR-111.

The highway-rail grade crossing located at milepost 6.83 will be updated to include the full complement of cross bucks, lights, gates, and bells.

The pavement width at the highway-rail grade crossing at milepost 6.83 is reduced from five lanes to two lanes and then expands back to five lanes. This creates congestion at this point because of reduced vehicle speeds and merging. West Jordan City has stated that plans are underway to widen this section to five lanes by the year 2009.

Figure 17 – Highway-Rail Grade Crossing at 4600 West (milepost 6.83)

West Jordan City has expressed concern that the school flashing beacon located at milepost 5.8 is too close (less than 100 feet) to the school grounds and the school crossing at Grizzly Way intersection. The MUTCD stipulates that school advance warning signs should be installed no less than 150 feet and no more than 700 feet in advance of the school grounds or school crossings. Therefore, this school flashing beacon is inconsistent with MUTCD standards.

3 FUTURE CONDITIONS FORECAST

In this section, future conditions for land use, population, travel demand, and mobility needs will be discussed to show potential growth and its impacts on road conditions.

3.1 Analysis Area

3.1.A Land Use Plans and Population Growth

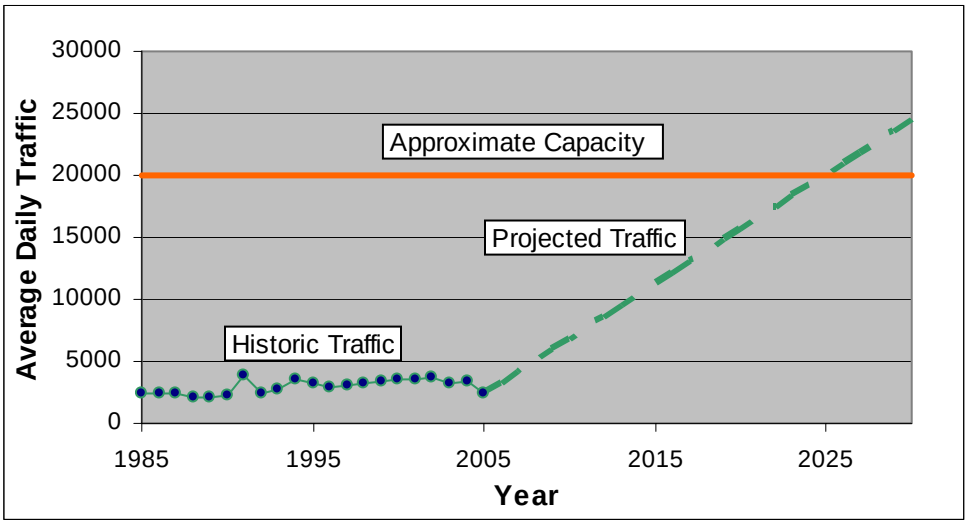
Future land use along the corridor in West Jordan City varies from residential to industrial. In Copperton, land use is mostly residential with low commercial use and some industrial instances.

3.1.B Travel Demand Growth

Traffic volume was projected to reflect Wasatch Front Regional Council (WFRC) 2030 volume estimates. The WFRC estimates future traffic based on socio-economic data.

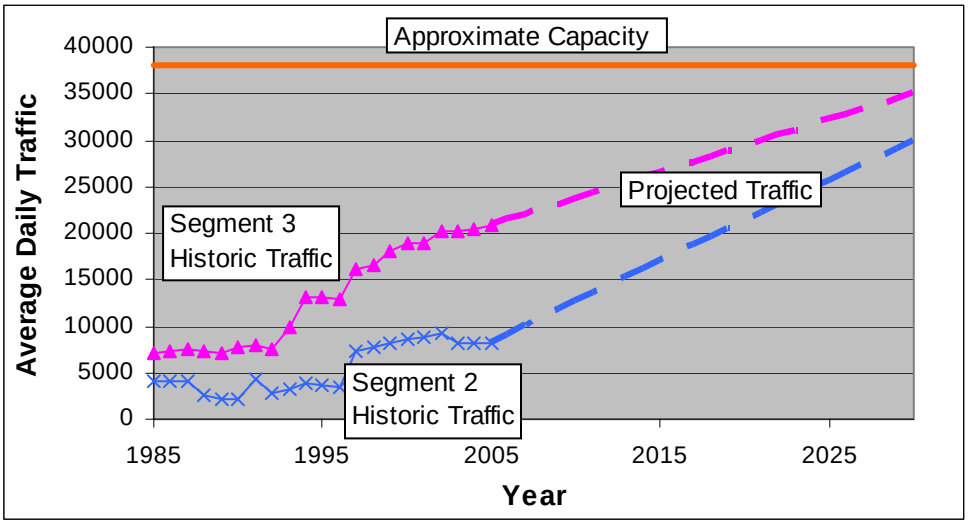
In Segment 1, SR-48 is a two-lane highway and has an estimated capacity of approximately 20,000 vehicles per day. As shown in Figure 18, capacity will be exceeded in Segment 1 by the year 2025. Segments 2 and 3 have four lanes and, in some locations, have a center turn lane. The capacity for these two sections is estimated to be 38,000 vehicles per day. Figure 19 shows that there are no capacity issues in these two segments.

Figure 18 – Traffic Forecast for Segment 1



Source: Traffic on Utah Highways; InterPlan

Figure 19 – Traffic Forecast for Segments 2& 3



Source: Traffic on Utah Highways; InterPlan

Table 12 – Projected Traffic Volumes			
Year	Segment 1	Segment 2	Segment 3
2005	2,389	8,264	20,835
2015	11,000	17,000	26,500
2030	24,500	30,000	35,000

3.1.C Present and Future Mobility Needs

The present and future mobility needs of the corridor are largely related to automobile traffic, such as widening segments of the roadway to meet travel demand. However, a discussion should be held concerning West Jordan City's desire to use the grid system because SR-48 diagonals across this planned transportation grid pattern. West Jordan City desires to use 9000 South as the main east/west connector from I-15 to Bangerter Highway and, eventually, to the proposed Mountain View Corridor. Communication between UDOT Planning, West Jordan City, UDOT Region 2, and the UDOT Mountain View Corridor Environmental Impact Statement Team design should occur soon.

4 PUBLIC INVOLVEMENT

The State Route 48 begins in Copperton, travels through West Jordan, and terminates in Midvale. However, the study limits for this study end in West Jordan. Both Copperton and West Jordan were involved in the study process through participating in a corridor drive and a public open house.

4.1 History of Public Involvement

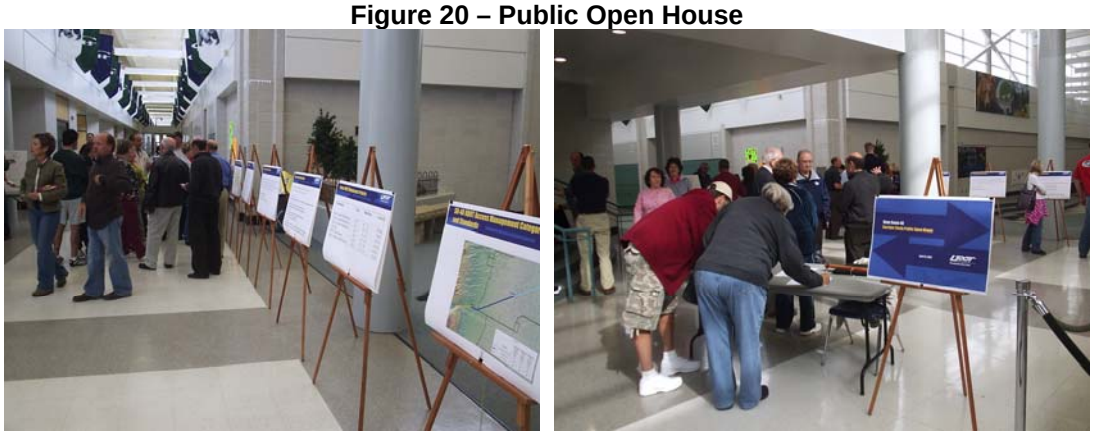
The corridor drive took place on December 12, 2006. Representatives from Copperton, West Jordan, UDOT Region Two, and UDOT Planning were invited to participate in the corridor drive. During the drive, several comments were made about coordination between UDOT and West Jordan and about future maintenance projects. This meeting provided a formal opportunity for communication to occur between the professional city staff and UDOT Maintenance staff.

The public open house took place from 4:30 p.m. to 7:00 p.m. on April 19, 2007 at Copper Hills High School. At least 82 people participated in the open house, and 73 written comments were received (see Appendix).

4.2 Outreach Methods and Tools Used

The public involvement coordinator for UDOT Planning worked with Region Two's public involvement coordinator to plan the public open house. A press release was written and sent to local newspapers, and an announcement was sent to all property owners fronting SR-48 within the study area (see Appendix).

Figure 20 – Public Open House



4.3 Groups Involved and Summary of Contacts Made

Most of the participation was by residents of Copperton and West Jordan. They visited with UDOT personnel, and many submitted written comments. The largest group involved represented

Copperton. Many Copperton residents were concerned that SR-48 would be relocated or even closed.

4.4 Summary of Public Concern

Most of the comments centered on the following three issues:

- Not relocating or closing SR-48
- Safety at the intersection of SR-48 and SR-111
- Widening the highway-rail grade crossing to four lanes

5 CORRIDOR-WIDE RECOMMENDATIONS

UDOT has four strategic goals upon which their transportation work is centered. The four strategic goals are listed below.

- Take Care of What We Have
- Make the System Work Better
- Improve Safety
- Increase Capacity

The deficiencies that are identified in this report are listed under the four goals.

5.1 Take Care of What We Have

5.1.A Maintenance and Operations Deficiencies

Maintenance and operations deficiencies that have been identified that include the following:

1. At milepost 5.34 there is a roughly patched area that reduces road surface smoothness. Patching could be done in such a way that it blends in well and does not create a rough area.
2. Striping could be refreshed during the next painting season at milepost 4.4 and milepost 5.34 to eliminate any confusion and possibly decrease the number of accidents. Faded lines were also observed at other locations.
3. Cracks could be sealed from milepost 0.5 to milepost 1.5.
4. The poor drainage at milepost 0.5 and milepost 1.13 could be repaired as soon as possible to prevent further pavement degradation.
5. Parts of Segment 1 have steep slopes outside the existing shoulders. Slope flattening may be needed at these locations.
6. There is no lighting in most of Segment 1, especially from milepost 2.0 to milepost 5.34.

5.1.B Right-of-way

Parcel maps show that there is sufficient right-of-way along most of the corridor and especially in Segment 1 where capacity improvements may be required in the future.

5.2 Make the System Work Better

5.2.A Access Management

Access management deficiencies that have been identified include the following:

1. Signal spacing between the three signalized intersections within Segment 3 is shorter than the minimum (2,640 feet) required for Category 3.

2. Signal spacing between the intersections at milepost 5.34 and milepost 5.8 is shorter than the minimum (2,640 feet) required for Category 4.

3. The spacing between two of the four driveways between milepost 5.34 and milepost 5.8 does not meet the standard (500 feet) for Category 4.

4. The spacing between two of the three driveways between milepost 1.5 and milepost 1.7 does not meet the standard (500 feet) for Category 4.

5. Copperhills Youth Center and Ron Wood Baseball Park do not have left turn and right turn lanes into the property. However, an application has been permitted by UDOT and construction should begin soon. Access management Category 4 requires right turn deceleration lanes and taper lengths for roads with peak hour right ingress turning volume of 25 vehicles per hour or greater.

6. Left turn lanes exist at the SR-48/SR-111 intersection. However, right turn lanes that have recently been constructed are not channelized. Constructing channelized right turn lanes would improve safety at this intersection.

Note: Access management standards may have been adopted after deficiencies such as signal spacing and driveways were built.

5.2.B Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) refers to transportation systems which apply emerging hard and soft information system technologies to address and alleviate transportation congestion problems. ITS can be subdivided into three categories: Advanced Traveler Information Systems (ATIS), Advanced Traffic Management Systems (ATMS), and Advanced Vehicle Control Systems (AVCS).

The following ITS strategies can help the corridor to function more efficiently:

1. Traffic signals could be synchronized to provide a smooth flow of traffic from one intersection to another.

2. Warning signs for intersections and wildlife could be installed at various locations.

5.3 Improve Safety

5.3.A Reduce Crash Rates

The rate of accident occurrence on this corridor may be reduced by:

1. Improving intersection operation by ensuring proper striping, signing, and signal timing.

2. Posting signs warning drivers about heavy truck traffic.

3. Paving shoulders, adding rumble strips, and improving clear zones by slope flattening to reduce roadway departure crashes and the severity of roadway departure crashes.

5.3.B Turn Lanes

Center and right turn lanes improve safety by reducing conflicts between motorists at intersections. However, turn lanes increase conflicts between motorists and bicyclists where bike lanes exist. Locations that should have turn lanes include:

1. Entrance into Ron Wood Baseball Park

2. Entrance into Copper Hills Youth Center

5.3.C Bike Lanes

Shoulders could be paved from milepost 3 to milepost 5 for bike use.

5.4 Increase Capacity

5.4.A Travel Demand Management

Travel Demand Management (TDM) is the planning and implementation of programs that seek to reduce road space demand by influencing travel choices and the amount and timing of travel. TDM aims to encourage more walking, cycling, public transit use, car-pooling, and tele-commuting.

The following strategies can help reduce demand for space on SR-48:

1. Accommodate bikes consistently with UDOT policies and plans.

2. Install sidewalks from milepost 4.5 to milepost 8.14 for both residential and commercial development.

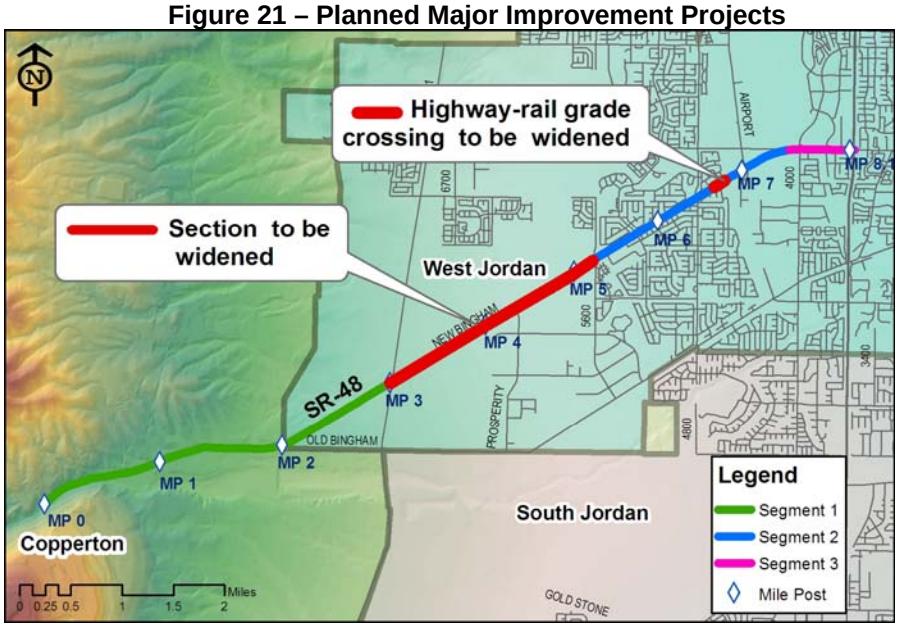
5.4.B Additional Highway Capacity

Table 13 and Figure 21 show WFRC planned improvement projects along SR-48.

Table 13 – Planned Major Improvement Projects

Location	Year	Improvement Type	Cost($)
SR-111 to 5600 West	2026-2030	Widen to 4-lane	50,400,000
Highway-rail grade crossing (milepost 6.65)	2008-2010	Widen to 4-lane	-

Figure 21 – Planned Major Improvement Projects



6 LIST OF RECOMMENDED PROJECTS AND COST ESTIMATES

The objective of this study was to identify existing deficiencies and future corridor operational, capacity, and geometric characteristics that will become needs. Another objective was to develop a list of improvement projects that will enhance the performance of the corridor. After analyzing the existing conditions and future requirements on SR-48, it is recommended that the improvements presented in Table 14 be implemented. This list also includes existing projects contained in the system preservation plan.

Table 14 – Recommended Improvement Projects

Project	Begin MP	End MP	Year	Cost Estimate
Segment 1				
1. Install curb and gutter^	1.0	2.0	2008	$202,000
2. Install safety improvements^ • Slope flatening • Install channelized turn lanes at SR-111 • Install turn lanes into Ron Wood Baseball Park • Install warning signs for intersections, wildlife, and heavy trucks	2.0	5.0	2008	$928,000
3. Minor asphalt rehabilitation*	0.0	1.4	2010	$455,606
4. Minor asphalt rehabilitation*	1.4	4.73	2011	$1,162,767
5. Chip seal*	4.73	5.34	2016	$100,508
6. Safety improvement*	4.73	5.34	2016	$211,284
7. Minor asphalt rehabilitation*	0.0	1.4	2020	$612,296
Segment 2				
1. Install safety improvements^ • Stripe shoulders for bike lanes • Install sidewalks • Relocate school flashing beacon	5.34	7.52	2008	$1,360,000
2. Chip Seal*	5.34	7.52	2016	$359,195
3. Safety improvement*	5.34	7.52	2016	$755,086
Segment 3				
1. Install safety improvements^ • Stripe shoulders for bike lanes	7.52	8.14	2008	$33,000
2. Chip seal*	7.52	8.14	2016	$102,156
3. Safety improvement*	7.52	8.14	2016	$255,142

**UDOT System Preservation Plan 2011-2020*

^InterPlan's Estimate Using UDOT's Statewide Standard Item Average Prices, 2006 (See Appendix)

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8 APPENDIX

Appendix 8A – Annual Average Daily Traffic (AADT)						
	Segment 1		Segment 2		Segment 3	
	(mp 0.0-mp 5.34)		(mp 5.34-mp 7.52)		(mp 7.52-mp 8.14)	
Year	AADT	Forecast	AADT	Forecast	AADT	Forecast
1985	2394		4075		7150	
1986	2344		4075		7325	
1987	2384		4145		7500	
1988	2019		2595		7410	
1989	2130		2165		7040	
1990	2324		2255		7635	
1991	3819		4335		8015	
1992	2455		2730		7500	
1993	2764		3275		9895	
1994	3500		3866		13065	
1995	3146		3563		13065	
1996	2940		3334		12800	
1997	3096		7289		16,220	
1998	3291		7640		16601	
1999	3452		8267		17960	
2000	3472		8672		18840	
2001	3504		8733		18965	
2002	3693		9321		20243	
2003	3193		8183		20243	
2004	3313		8232		20365	
2005	2389		8264		20835	
2006		3273		9133		21402
2007		4158		10003		21968
2008		5042		10872		22535
2009		5927		11742		23101
2010		6811		12611		23668
2011		7696		13481		24235
2012		8580		14350		24801
2013		9465		15220		25368
2014		10349		16089		25934
2015		11233		16958		26501
2016		12118		17828		27068
2017		13002		18697		27634
2018		13887		19567		28201
2019		14771		20436		28767
2020		15656		21306		29334
2021		16540		22175		29901
2022		17424		23044		30467
2023		18309		23914		31034
2024		19193		24783		31600
2025		20078		25653		32167
2026		20962		26522		32734
2027		21847		27392		33300
2028		22731		28261		33867
2029		23616		29131		34433
2030		24500		30000		35000

Appendix 8B – Accident Data Analysis for SR-48							
Segment		2002			2003		
Beg MP	End MP	# of Accidents	AADT	Accident Rate	# of Accidents	AADT	Accident Rate
0.00	1.08	4	3,445	2.95	4	3,385	3.00
1.08	1.81	2	3,445	2.18	2	3,385	2.22
1.81	3.02	16	3,516	10.30	9	3,455	5.90
3.02	5.34	6	4,365	1.62	14	2,545	6.50
Weighted Average Values (Segment 1, mp 0.0 - mp 5.34)			**3860.79**	**3.93**		**3035.92**	**5.07**
5.34	5.80	17	4,365	23.20	20	2,545	46.80
5.80	5.99	4	4,365	13.21	7	2,545	39.66
5.99	6.99	33	10,973	8.24	41	10,063	11.16
6.99	7.52	36	17,580	10.59	44	17,580	12.94
Weighted Average Values (Segment 2, mp 5.34 – mp 7.52)			**10608.78**	**12.40**		**9648.69**	**21.60**
7.52	7.82	42	20,020	19.16	49	20,020	22.35
7.82	8.14	80	20,465	33.47	79	20,465	33.05
Weighted Average Values (Segment 3, mp 7.52 – mp 8.14)			**20249.68**	**26.54**		**20249.68**	**27.87**

Appendix 8C – Accident Data Analysis for SR-48							
Segment		2004			2005		
Beg MP	End MP	# of Accidents	AADT	Accident Rate	# of Accidents	AADT	Accident Rate
0.00	1.08	11	3,540	7.88	1	1,590	1.60
1.08	1.81	3	3,540	3.18	3	1,590	7.08
1.81	3.02	15	3,610	9.41	23	3,730	13.96
3.02	5.34	17	2,560	7.84	12	2,645	5.36
Weighted Average Values (Segment 1, mp 0.0 - mp 5.34)			**3130.09**	**7.57**		**2533.26**	**6.78**
5.34	5.80	14	2,560	32.57	13	2,645	29.27
5.80	5.99	4	2,560	22.53	0	2,645	0.00
5.99	6.99	58	10,123	15.70	54	10,138	14.59
6.99	7.52	39	17,685	9.74	51	17,630	14.95
Weighted Average Values (Segment 2, mp 5.34 – mp 7.52)			**9706.22**	**18.41**		**9725.07**	**16.51**
7.52	7.82	65	20,140	29.47	93	20,610	41.21
7.82	8.14	80	20,590	33.27	82	21,060	33.34
Weighted Average Values (Segment 3, mp 7.52 – mp 8.14)			**20372.26**	**31.43**		**20842.26**	**37.15**

Appendix 8D – Accident Data Analysis in Segment 1							
		2002			2003		
Beg MP	End MP	# of Accidents	AADT	Accident Rate	# of Accidents	AADT	Accident Rate
0.00	1.08	4	3,445	2.95	4	3,385	3.00
1.08	1.81	2	3,445	2.18	2	3,385	2.22
1.81	3.02	16	3,516	10.30	9	3,455	5.90
Weighted Average Values (Copperton)			**3473.45**	**5.71**		**3413.05**	**3.97**
3.02	5.34	6	4,365	1.62	14	2,545	6.50
Weighted Average Values (Segment 1A)			**4,365**	**1.62**	**14**	**2,545**	**6.50**

Appendix 8E – Accident Data Analysis in Segment 1							
		2004			2005		
Beg MP	End MP	# of Accidents	AADT	Accident Rate	# of Accidents	AADT	Accident Rate
0.00	1.08	11	3,540	7.88	1	1,590	1.60
1.08	1.81	3	3,540	3.18	3	1,590	7.08
1.81	3.02	15	3,610	9.41	23	3,730	13.96
Weighted Average Values (Copperton)			**3568.05**	**7.36**		**2447.42**	**7.88**
3.02	5.34	17	2,560	7.84	12	2,645	5.36
Weighted Average Values (Segment 1A)			**2,560**	**7.84**		**2,645**	**5.36**

Appendix 8F - Cost Estimates for SR-48					
ITEM	COST	UNIT	QUANTITY PER LINEAR FOOT		COST PER LINEAR FOOT OF ROADWAY
Curb and Gutter	$36.40	Ft	2*1	2.0	$ 72.80
Mobilization and Temporary Traffic Control	calculated @ 15% of subtotal				$ 10.92
Contingency	calculated @ 20% of subtotal				$ 14.56
				Subtotal	$ 25.48
Engineering, construction, management, drainage & utilities	calculated @ 40% of subtotal				$ 10.19
Contingency for Price Increases	calculated @ 10% of subtotal				$ 2.55
TOTAL COST PER LINEAR FOOT					$ 38.22
TOTAL COST OF SAFETY IMPROVEMENTS FROM MILEPOST 1 TO MILEPOST 2					**$ 201,801.60**

ITEM	COST	UNIT	QUANTITY PER LINEAR FOOT		COST PER LINEAR FOOT OF ROADWAY
TOTAL COST PER LINEAR FOOT OF TURN LANE					$ 413.79
	Subtotal				$ 413.79
Channelization	calculated @ 25% of subtotal				$ 103.45
TOTAL COST PER LINEAR FOOT OF TURN LANE PLUS CHANNELIZATION					$ 517.24
COST OF 4, 250' LONG TURN LANES					$ 517,237.50
Slope flattening	$0.36	Ft^3	12*4*1	48.0	$ 17.28
COST OF SLOPE FLATTENING FOR 3 MILES					$ 273,715.20
Engineering, construction, management, drainage & utilities	calculated @ 40% of subtotal				$ 109,486.08
Contingency for Price Increases	calculated @ 10% of subtotal				$ 27,371.52
TOTAL COST OF SAFETY IMPROVEMENTS FROM MILEPOST 2 TO MILEPOST 5					**$ 927,810.30**

ITEM	COST	UNIT	QUANTITY PER LINEAR FOOT		COST PER LINEAR FOOT OF ROADWAY
Concrete Sidewalk (5' wide)	$3.80	Ft^2	5*2*1	10.0	$ 38.00
Sidewalk Untreated Base Course - 1" Max (3"thick)	$0.89	Ft^3	5*(3/12)*2*1	2.5	$ 2.22
Landscaping & Grading (4' wide)	$0.09	Ft^2	4*2*1	8.0	$ 0.72
Pavement Marking Paint	$2.45	Ft	4*1	4.0	$ 9.80
				Subtotal	$ 50.74
Environmental & Design	calculated @ 15% of subtotal				$ 7.61
				Subtotal	$ 58.35
Mobilization and Temporary Traffic Control	calculated @ 15% of subtotal				$ 8.75
Contingency	calculated @ 20% of subtotal				$ 11.67
				Subtotal	$ 78.77
Engineering, construction, management, drainage & utilities	calculated @ 40% of subtotal				$ 31.51
Contingency for Price Increases	calculated @ 10% of subtotal				$ 7.88
TOTAL COST PER LINEAR FOOT					$ 118.15
TOTAL COST OF SAFETY IMPROVEMENTS FROM MILEPOST 5.34 TO MILEPOST 7.52					$ 1,359,988.44

ITEM	COST	UNIT	QUANTITY PER LINEAR FOOT		COST PER LINEAR FOOT OF ROADWAY
Pavement Marking Paint	$2.45	Ft	2*1	2.0	$ 4.90
				Subtotal	$ 4.90
Mobilization and Temporary Traffic Control	calculated @ 15% of subtotal				$ 0.74
Contingency	calculated @ 20% of subtotal				$ 0.98
				Subtotal	$ 6.62
Engineering, construction, management, drainage & utilities	calculated @ 40% of subtotal				$ 2.65
Contingency for Price Increases	calculated @ 10% of subtotal				$ 0.66
TOTAL COST PER LINEAR FOOT					$ 9.92
TOTAL COST OF SAFETY IMPROVEMENTS FROM MILEPOST 7.52 TO MILEPOST 8.14					$ 32,482.30